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ELAS8—Computer Program for Linear Structure Equilibrium Problems

The problem:

To handle the equilibrium problems of linear structures of one-, two-, or three-dimensional continua.

The solution:

ELAS8, which generates and solves the governing equations for the unknown deflections of the mesh points as if the problem were to locate the stationary point of the total potential energy function associated with the given loading and unknown deflections.

How it's done:

The solution is obtained by means of the displacement method and the finite element technique. Almost any geometry and structure may be handled because of the availability of linear, triangular, quadrilateral, tetrahedral, hexahedral, conical, and triangular and quadrilateral torus elements. The piecewise linear deflection distribution assumption is used to insure monotonic convergence of the deflections from the stiffer side with decreasing mesh size. The stresses are provided by the best-fit strain tensors, in the least-squares sense, at the mesh points where the deflections are given. The selection of local coordinate systems, whenever necessary, is automatic. Efficient core memory usage is achieved by dynamic memory allocation, an optional mesh-point relabelling scheme, imposing boundary conditions during the assembly time, and straight-line storing of the stiffness matrix rows within a variable band-

width and the main diagonal.

With a 32K-word core memory, the number of unsuppressed degrees of freedom that can be handled in a given problem is 500 to 600 for a typical structure, but might far exceed those average values for special types of problems. Also with larger core memories, larger problems can be solved.

Notes:

1. This program is written in FORTRAN V for use on the UNIVAC-1108 computer.
2. The ELAS program written for the IBM-7094-7044 direct-coupled system in the FORTRAN II and FAP languages is COSMIC program NPO-10598. (NASA Tech Brief number 68-10187).
3. Requests for further information may be directed to:

COSMIC
Barrow Hall
University of Georgia
Athens, Georgia 30601
Reference: B71-10185

Patent status:

No patent action is contemplated by NASA.

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